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1 **Novel Occlusive Dressing**

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3 The present invention relates to the field of occlusive
4 dressings and, more specifically, to occlusive dressings
5 which allow the escape of fluid and air in cases of
6 penetrating thoracic trauma.

7

8 In the majority of cases where serious injury occurs, it
9 is necessary to apply a dressing to the wound in
10 question. In the cases of penetrating thoracic trauma,
11 an object like a bullet, knife or metal fragment for
12 example has penetrated the chest wall, or both the chest
13 wall and the lung itself, exposing the pleural space to
14 the atmospheric pressure of the outside environment.

15

16 In order for a patient to breathe, it is necessary to
17 maintain a proper pressure differential between the
18 pleural cavity and the outside environment. Normally,
19 the visceral and parietal pleura are separated by the
20 pleural space, which itself is filled with pleural fluid.
21 Typically, during inspiration, the rib cage expands,
22 pulling the parietal pleura away from the visceral
23 pleura. A negative pressure in the pleural space then

1 develops in the lungs themselves, and positive
2 atmospheric pressure forces air into the lungs.

3

4 When the normal negative pressure of the pleural space is
5 exposed to the more positive atmospheric pressure in
6 cases of trauma, outside air flows into the pleural space
7 through the wound or through the punctured lung, causing
8 a tension pneumothorax to develop. This is a very
9 serious medical problem and eventually can result in the
10 collapse of the lung, cardio-pulmonary collapse,
11 unconsciousness, followed soon thereafter by cardio-
12 pulmonary arrest and death.

13

14 It can therefore be seen that it is very important that a
15 dressing be applied to the wound which prevents any air
16 from entering the pleural space through the wound.

17 However, at the same time, the dressing must allow air
18 entering the pleural space through a punctured lung to
19 escape from the wound, along with any blood that may have
20 leaked into the pleural space as a result of the trauma.
21 A dressing of this type would allow the proper pressure
22 differential to at least partially be maintained between
23 the pleural cavity and the outside environment.

24

25 A number of dressings, solutions exist and have been used
26 to try and deal with this issue. The most basic solution
27 paramedics commonly use are ad-hoc dressings created on-
28 site, an example of which is shown in Figure 1,
29 consisting of a piece of sterile plastic 12 laid flat on
30 the patient 7 and wrap taped on three sides around the
31 area of the wound 8 with adhesive tape 11. The fourth
32 side is left open to allow air and fluid to escape.
33 However, this is an extremely time consuming operation,

1 and often results in the dressing being applied
2 incorrectly, which can still lead to development of a
3 tension pneumothorax. Other dressings also exist.
4 Another example of a dressing 25 is shown in Figure 2,
5 and includes a planar surface 26 which adheres to the
6 patient around the wound, the dressing also has a valve
7 26 protruding at 90° from the surface of the dressing.
8 The dressing is also provided with a large grip tag 28.
9 The dressing is opaque. This opacity results in the
10 application of the dressing being difficult. The
11 dressing design also can cause problems for the person
12 applying the dressing to a patient, as discharges of
13 bodily fluids are directed towards them. There is also
14 the issue that as the valve 26 protrudes from the
15 dressing 25, it is difficult to apply a number of
16 dressings to, for example, both the front and rear of a
17 patient, as in gun shot cases where there is both an
18 entry and exit wound. There is also the issue that even
19 in cases where such dressings are transparent to allow
20 visualisation of the wound, because the valve is
21 protruding from the centre of the dressing, this
22 obstructs the view of the wound.

23
24 It can be seen that it would be beneficial to be able to
25 provide an occlusive dressing appropriate for use in
26 penetrating thoracic trauma cases.

27
28 According to the present invention, there is provided a
29 dressing comprising a bandage section, having a perimeter
30 sufficient to occlude a wound, and a valve section that
31 allows the escape of fluid, wherein the valve section
32 lies substantially on the same plane as the bandage
33 section.

1
2 Preferably the bandage section comprises a transparent
3 area.

4
5 Preferably an outer edge of the bandage section is
6 provided with adhesive.

7
8 Preferably the adhesive is covered with a removable
9 protective outer film.

10
11 Preferably the valve section comprises a one-way valve.

12
13 Preferably the valve section comprises a flutter valve.

14
15 Optionally the flutter valve comprises one leaflet.

16
17 Alternatively the flutter valve comprises two leaflets.

18
19 Preferably the valve section further comprises a rigid
20 casing.

21
22 Most preferably the one-way valve is housed in a
23 substantially rigid casing.

24
25 Preferably the bandage section is substantially
26 elliptical or circular in shape.

27
28 Preferably the bandage section is provided with an
29 extending tag section allow for easy gripping.

30
31 Preferably the valve section can be provided with a
32 collection bag.

33

1 Preferably the dressing is manufactured from a waterproof
2 material.

3

4 Preferably the dressing is manufactured from non-
5 allergenic material(s).

6

7 Preferably the dressing is manufactured from a plastic
8 material.

9

10 Optionally the dressing is manufactured from latex.

11

12 Optionally the valve section is provided with an
13 irrigation flushing system.

14

15 Preferably the irrigation flushing system comprises an
16 aperture in the casing of the valve section through which
17 fluid can be inserted.

18

19 Alternatively the irrigation flushing system comprises a
20 tube and a valve.

21

22 Most preferably the tube is provided with perforations.

23

24 Optionally the bandage section comprises one or more
25 membrane layers.

26

27 Preferably air or fluid is provided between the layers,
28 such that tension is applied to a wound.

29

30 In order to provide a better understanding of the present
31 invention, embodiments will now be described by way of
32 example only and with reference to the following
33 drawings, in which:

1
2 Figure 1 shows an ad-hoc dressing used in emergency
3 situations;
4
5 Figure 2 shows prior art of an existing occlusive
6 dressing; and
7
8 Figure 3 shows a plan view of a dressing according to one
9 embodiment of the present invention;
10
11 Figure 4 shows a cross-section view of the valve section
12 of the dressing of Figure 3;
13
14 Figure 5 shows a side cross-section view of the valve of
15 Figure 4;
16
17 Figure 6 shows an alternative embodiment of a valve
18 according to the present invention;
19
20 Figure 7 shows an example of the dressing in use
21 according to the present invention;
22
23 Figure 8 shows a cross-section of a second embodiment of
24 the dressing according to the present invention;
25
26 Figure 9 shows a cross-section of a third embodiment of
27 the valve section according to the present invention; and
28
29 Figure 10 shows a cross-section of a fourth embodiment of
30 the dressing according to the present invention.
31
32 As can be seen in Figure 3, there is provided an
33 occlusive dressing 1, the dressing having a bandage

1 section 3 and a valve section 4. The bandage section 3
2 is substantially elliptical in shape, which provides it
3 with ergonomic characteristics, making it easier to use
4 than the standard square type bandages. The bandage
5 section 3 is provided with an outer area 15 and a central
6 transparent area 2, which allows the underlying wound to
7 be visualised by a paramedic or doctor, even whilst the
8 dressing 1 is in use. The outer area 15 is coated on the
9 underside with adhesive to ensure the dressing 1 adheres
10 to the patient. Valve section 4 includes a one-way valve
11 which allows the exiting of air and fluids from the wound
12 over which the dressing is placed, whilst preventing the
13 intake of air into the wound, which would disrupt the
14 equilibrium in the pleural cavity. In this case the
15 valve of the valve section 4 is a flutter valve.

16

17 The dressing 1 is often provided with a large grip tag
18 10, which allows both easy removal of the dressing 1 when
19 required, even whilst the person providing assistance is
20 wearing gloves. The tag also allows the adhesive on the
21 reverse of the dressing 1 to be uncovered easily, as
22 typically it will be covered in an appropriate material,
23 such as thin plastic film, prior to use, which is then
24 quickly removed when the dressing is required to be fixed
25 in place on a patient.

26

27 Figure 4 is a cross-section diagram of the valve section
28 4 of Figure 3. Here it can be seen that in this
29 embodiment the valve section 4 includes a flutter valve
30 6, wherein valve leaflets 6a and 6b are maintained
31 together by atmospheric pressure, but allow the escape of
32 fluids when pressure inside the dressing increases, but
33 not the ingress of air. The flutter valve 6 is

1 provided with a rigid outer casing 5, which strongly
2 reduces the likelihood of the valve suffering blockages
3 due to compression, making the valve section 4 generally
4 more robust for use in emergency situations.

5

6 A side cross-section of the valve section 4 can be seen
7 in Figure 5. The valve section 4 has a rigid outer
8 casing 5. The valve 6 is formed of an upper leaflet 6a
9 and a lower leaflet 6b. The valve 6 allows fluids to
10 escape from the site of the wound without allowing air,
11 fluids or other matter entering the wound, as atmospheric
12 pressure maintains the leaflets 6a and 6b in a closed
13 position, however fluid can force its way through the
14 valve 6 from within the dressing. The lower surface of
15 the dressing 1a is provided with adhesive 14 to secure
16 the dressing to the patient.

17

18 A cross-section of an alternative valve section 40 is
19 illustrated in Figure 6. In this arrangement the valve
20 60 comprises a single leaflet 60c which is maintained
21 against the casing 5 by atmospheric pressure to act as a
22 flutter valve.

23

24 Figure 7 shows an example of the dressing 1 in use on a
25 wound 8 position on the upper torso of a patient 7. It
26 can be seen that the dressing 1 is positioned over the
27 wound 8 with the ergonomic shape of the bandage section 3
28 and the transparent area 2, ensuring that the positioning
29 of the dressing is both rapid and easy. The adhesive
30 applied to the lower surface 1a of the outer area 15 and
31 casing 5 secures the dressing 1 to the patient 7
32 providing an airtight seal around the wound 8 and thus
33 allowing the dressing 1 to operate. Any air that is

1 escaping from the wound 8, or any blood or liquid that is
2 escaping due to the wound 8, is able to drain away
3 through the valve section 4 on the dressing 1. However,
4 as the valve 6 is a one-way valve, no air or liquid,
5 etc., is able to regress back into the wound 8 from the
6 external environment. In the illustrated embodiment, a
7 collection bag 9 is positioned at the emission end 4b of
8 the valve section 4 to allow air and bodily fluids to be
9 kept in one place. This collection bag 9 can further be
10 provided with apertures or will be produced in the matter
11 that allows gaseous exchange with the external
12 environment, so that liquid will be retained in the bag
13 whilst gases emitted from the wound can escape.

14

15 The dressing 1 is designed in such a manner that it is
16 user friendly and can be manufactured in non-allergenic
17 material, which increases the likelihood of adoption by
18 medical and NHS staff. There are a number of benefits to
19 this dressing 1 over and above dressings that have been
20 suggested in the past. The ergonomic design of the
21 dressing 1, along with the transparent nature of area 2
22 that is not obstructed by the valve section 4 in any
23 manner, increases the speed of application and reduces
24 the time that it would take to deliver a patient to
25 hospital, for example.

26

27 The described dressing 1 also does not require careful
28 positioning on the patient in order to allow the wound 8
29 to breathe, as the wound will be clearly visible. As
30 covering a wound 8 and stopping it from breathing can
31 lead to tension pneumothorax, it is advantageous that
32 even a speedy application of the dressing 1 described in
33 this invention would not cause this problem.

1
2 Another benefit to the dressing 1 described in the
3 present invention is that the valve section 4 lies flat
4 on the patient, as it is substantially on the same plane
5 as the bandage section 3, rather than protruding
6 perpendicularly, as in the case of previously described
7 dressings. This protects the person applying the
8 dressing 1 from the discharge of bodily fluids from the
9 wound which offers improved health and safety conditions.
10 The positioning of the valve section 4 also has the major
11 benefit of allowing dressings to be applied to both the
12 rear of the patient and the front of the patient, without
13 resulting in discomfort or additional damage to the
14 patient.

15
16 The transparent area 2 offers the applicator an
17 unobstructed view of the wound 8, which is significantly
18 beneficial over prior dressings, as it allows the
19 applicator to monitor the condition of the wound 8,
20 whilst still sealing the wound 8 and stopping air from
21 penetrating, resulting in a sucking wound and the
22 possibility of a tension pneumothorax. It also allows
23 the person applying the dressing 1 to visualise the wound
24 8. The one-way valve reduces the possibility of
25 infection or infectious agents penetrating the wound 8.

26
27 The dressing 1 described in the present invention can
28 also be used as a pressure dressing to stem the flow of
29 blood and improve the patient's situation. A cross-
30 sectional diagram of such a dressing is shown in Figure
31 8. As can be seen, the dressing 1 is provided with a
32 membrane 19 which forms an additional layer 25 in the
33 cavity of the dressing. The layer can be filled with air

1 or fluid to provide constant tension on the wound acting
2 to stem the flow of blood.

3

4 It is also worth noting that the use of a dressing 1,
5 highlights the location and the possible type of wound 8
6 to the staff at a receiving hospital, allowing faster
7 assessment of the wound 8.

8

9 The rigidity of the valve outer casing 5 is also very
10 important, as it reduces the likelihood of valve
11 blockages due to compression, i.e., by the patient
12 rolling his body weight onto the dressing, and decreases
13 the likelihood of a tension pneumothorax occurring. Such
14 rigidity also allows the dressing 1 to be handled much
15 more roughly, standing up to the extreme conditions often
16 faced in an emergency situation.

17

18 Figure 9 shows a cross-section of a third embodiment of
19 the occlusive dressing which includes an irrigation
20 flushing system 26. As can be seen, the valve section 4
21 is made up of an outer casing 5, as well the valve 6
22 comprising leaflets 6a and 6b. The outer casing 5 is
23 formed of a rigid material such as hard plastic. An
24 aperture 28 is provided in the outer casing 5 in which an
25 inlet valve component 15 of the irrigation system 26 is
26 positioned. Within the valve section 4, the irrigation
27 system 26 comprises a tube 16, connected to the inlet
28 valve 15. The tube is provided with perforations 17.
29 The inlet valve may be a one-way valve, however it may
30 alternatively be a rotating valve, a locking valve or any
31 other type of appropriate valve. A syringe or similar
32 fluid filled receptacle can be inserted into the aperture
33 18 of valve 15 and water or other appropriate fluid can

1 be flushed through the valve section 4 to clean out the
2 inside of the valve 6.

3

4 Figure 10 shows the cross-section of a fourth embodiment
5 of the dressing 1 which includes a combined irrigation
6 and inflation function, the operation of which is
7 controlled via the inlet valve 15, which in this case is
8 a three-way valve.

9

10 The collection bag 9 may be removably attached to the
11 base of the valve section 4, to allow the collection of
12 any fluids, or it may be formed integrally with the
13 dressing 1.

14

15 In conclusion, the dressing described in the present
16 invention has a number of benefits over the prior art.
17 However, the abovementioned description should not be
18 taken as being limiting, as further modifications and
19 improvements can be made by one skilled in the art within
20 the scope of the invention herein disclosed.

21

22 It should be noted that the lower surface 1a may be
23 coated directly with adhesive, however it may
24 alternatively be provided with a layer of closed cell
25 foam which is coated with adhesive. The closed cell foam
26 ensuring the dressing confirms to the contour of the
27 patient's skin and providing a complete seal.

28

29 Although the illustrated dressing is provided with a tag,
30 however this tag is provided merely to improve ease of
31 handling, the dressing does not need to be provided with
32 a tag.

33

- 1 Ideally the dressing is transparent, but the dressing is
- 2 still functional and will help manage the condition of
- 3 the patient even if not transparent.
- 4
- 5 The dressing should be waterproof material, ideally it
- 6 can be formed of plastics.